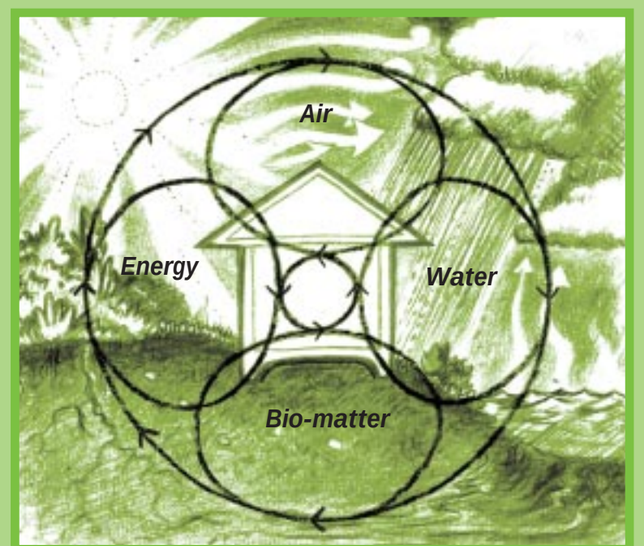


Easy Guide to Eco-Building

Design, build and live
with the environment

Hamilton City Council
Te kaunihera o Kirikiriroa

BRANZ
THE RESOURCE CENTRE FOR BUILDING EXCELLENCE

Auckland Regional Council

This booklet was funded with the assistance of the Ministry for the Environment through their Sustainable Management Fund.

Printed on recycled content paper with vegetable based inks

DESIGN & ILLUSTRATION - Ben Moore - KAPOW VISUAL

This booklet is an introduction to green building. It highlights important issues to consider and provides links to relevant New Zealand material.

The content was prepared by the Auckland Regional Council, the Hamilton City Council and the Building Research Association of New Zealand (BRANZ), funded in part by the Ministry for the Environment under their Sustainable Management Fund.

Comments and recommendations on this booklet are welcomed
- please phone Roman Jaques (04) 235 7600 or e-mail branzraj@branz.org.nz

***The 'Easy Guide to Eco-Building'* can also be found at:**
www.branz.org.nz (under 'resources')

THANKS to all the reviewers who contributed to this booklet.

15 **'Maintaining Your Home'**
Practical maintenance advice on common problems and their causes.
Contents: *caring for your building - common problems - quick response maintenance - preventative maintenance - exterior cleaning - condition checks - inspection checks - successful painting etc.* **Cost:** $28.95. BRANZ, ph 0800 80 80 85 (press 3 for publication sales), or see your building supply merchant.

16 **'Buy it Back' nation-wide database** (recycled product listings)
Database on products containing recycled content.
Cost: Free. Auckland Regional Council administered, ph: 366 2070 or visit www.arc.zerowaste.co.nz.

17 **Re-Use of Resources**
Ring your local regional/city council for the nearest material exchange database. This hooks up people and businesses who are trying to get rid of a wide range of materials, with those who are looking for similar materials.

18 **Permaculture Contacts**
Supporting sustainable human settlement and education in eco-design, environmental restoration and appropriate technology. Visit the Permaculture Research Institute at www.permaculture.org.au or email the Permaculture Institute of NZ - pinz@eartheal.org.nz or ph: 07 866 6735.

19 **Relevant Standards**
NZS 4297: 1998 Engineering design of earth buildings
NZS 4298: 1998 Materials and workmanship for earth buildings
NZS 4299: 1998 Earth buildings not requiring specific design
AS/NZS 1547: 2000 On-site domestic wastewater management
AS/NZS 1546.2 (draft) Waterless composting toilets
NZS 4218: 1996 Energy Efficiency - Housing and small building envelope

11

'Reducing Heat Loss from Existing Houses'
BRANZ Bulletin 334 (1995). A practical leaflet mainly targeting existing houses, with some advice for new houses also. **Contents:** *draughts and ventilation - finding air leaks - draught stripping materials and methods etc.* **Cost:** $6. BRANZ ph 0800 80 80 85 (press 3 for publication sales) or visit www.branz.org.nz.

12

'Environmental Impacts of Building Elements'
Set of leaflets detailing the life cycle impacts of building materials, divided into application (e.g. wall cladding, floor covering). **Contents:** *product composition - life cycle stages - health implications in use - general information.* **Cost:** $125. New Zealand Institute of Architects. ph 09 623 6080 or visit www.nzia.co.nz (under publications).

13

'The Good Wood Guide' (1999 update)
An 'in-a-nutshell' guide on how to buy wood which is less environmentally damaging. **Contents**: *recommended timber - timbers to avoid - timber suppliers - helpful products and services - other timber related businesses etc.* **Cost:** Free. Friends of the Earth, ph 04 385 6728 or visit www.converge.org.nz/gwg/index.html#In.

14

'Eco-Living New Zealand'
An excellent resource for a wide range of practical and relevant eco-related issues, published quarterly. **Contents:** *healthy family living - organic gardening - alternative power - earth architecture - natural materials - book and product reviews etc.* **Cost:** $4.95 per issue. Email - Fred@ecoliving.co.nz.

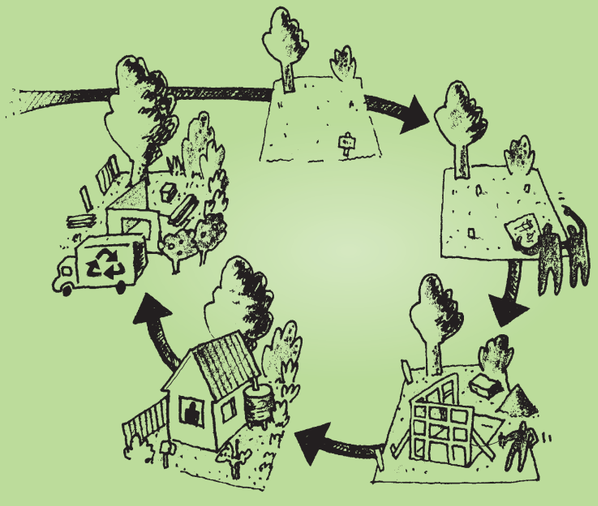
Contents

First published 2000.

Easy Guide to Eco-Building

This booklet shows how to carry out construction projects with consideration for the environment, while increasing building performance and comfort. It suggests issues to consider and practical things to do, from the start of the design to the end of the building's lifetime. Many of the suggestions will also save you money - mostly with short pay-back periods.

There is no one right way to create sustainable buildings, but important choices at every stage of a building's life can influence its environmental performance.



6 **'Reducing Waste from Building Sites'**
BRANZ Bulletin 383 (1999). Practical advice on how to be material efficient, in an eight page leaflet form. **Contents:** *how to reduce waste and save money - formulate an environmental policy - start a waste management plan.* **Cost:** $6. Ph 0800 80 80 85 press 3 for publication sales.

7 **'REBRI Resource Guide' and membership program**
Practical advice on how to be more resource efficient - join the program or just get the folder. **Contents:** *how to increase profit in being more resource efficient - how to reduce waste in design, construction and demolition stages - 8 steps to resource efficiency - tip sheets - case studies.* **Cost:** Folder $40, Membership $50-200 dependent on size of business. Auckland Regional Council, ph: 366 2070 or visit www.arc.govt.nz/REBRI.

8 **'Sustainable Home Guidelines'**
A comprehensive guide for healthier and more sustainable residential building, renovating and living, for you and the environment. Available in a folder and on the Web. **Contents:** *household safety - avoiding construction waste - site earthworks - design for the sun - insulation - heating your home - heating water - household appliances - light and lighting - saving water - using rainwater - building materials - earth building etc.* **Cost:** $35. Waitakere City Council, ph. 09 836 8000, or visit www.waitakere.govt.nz/ecocity.

9 **'Passive Solar Design for New Zealand Homes'**
EECA, ph 470 2200, or visit www.eeca.govt.nz (under 'homes'). An excellent introduction to the principles of designing with the sun in mind. Available as a leaflet and downloadable off the Web. **Contents:** *the concept - site planning and orientation - collecting - storing and conserving solar heat - avoiding overheating - environmental impacts and costs.* **Cost:** Free.

10 **Energy Efficiency and Conservation Authority (EECA)**
For practical energy advice, tips and general information. For a comprehensive national list of consultants, products and services, visit their Web page. Incorporates the downloadable 'Energy-Wise Homes' magazine (also available as a leaflet).
Contents: *energy - insulation - draught control - home heating - hot water appliances*
Cost: Free. Ph 470 2200, or visit www.eeca.govt.nz (under 'homes').

Further information in NZ

1 **'Subdivision for People and the Environment'** SNZ HB 44/2001
Guidelines and design information to assist environmentally sensitive land development. **Contents:** *clustering buildings - common open space - green streets - solar access - low impact roading - on-site stormwater, sewage treatment and power generation - tenure ship options - alternative technology providers.* Avialable (Nov 2001) from Standards New Zealand, ph 04 498 5990, or www.standards.co.nz

2 **'Developers' Design Guide'**
Guidelines for residential subdivision and medium density housing, to help developers and residents understand principles and important issues which should be addressed. **Contents:** *designing with nature - good linkages - well connected streets - integrated open spaces - safe roads - minimum lot width and depths - privacy, etc.* **Cost:** Free. Waitakere City Council, ph. 09 836 8000 or visit www.waitakere.govt.nz/ecocity.

3 **Listing of Green Architects and Designers**
EITHER - visit the Energy Efficiency and Conservation Authority (EECA) database: www.eeca.govt.nz (click 'renewables', then 'energy-wise renewable products & services database') **OR** for a list of building professionals who are qualified to environmentally audit house designs, contact BRANZ Accredited 'Green Home Scheme' Assessors. Ph 04 235 7600, fax 04 235 6070 or visit www.branz.org.nz (under 'resources').

4 **'The Green-Home Scheme'**
A procedure for auditing new houses, rating a range of environmental, health and safety issues, with certificates awarded for good designs. Assessments carried out by building experts. **Contents:** *household energy consumption - resources and recycling - water economy - site selection - lighting - waste disposal - smoke alarms - indoor pollutants etc.* **Cost:** $100 per certificate.
BRANZ ph 04 235 7600, or visit www.branz.org.nz (under 'resources').

5 **'Better Building Code'**
A voluntary minimum environmental standard for commercial buildings - but also useful for domestic buildings - with appropriate tender clauses for each life stage. **Contents:** *tendering/briefing documentation at concept, detailed design, construction stage - as well as for existing buildings.* **Cost:** Free. Waitakere City Council ph. 09 836 8000, or visit www.waitakere.govt.nz/ecocity.

Benefits

The benefits of sustainable building are related to our economy, culture, health and well-being.

They include:

- increasing the quality and comfort of our everyday living surroundings
- improving people's physical and mental well-being
- lower disposal costs and less material wastage
- using (virgin/re-used/recycled) materials efficiently
- better use of sunlight, water, energy and air
- longer life expectancy of building materials
- better planning, therefore improved budgeting, reduced water, air and land pollution.

Guiding Principles

Building for sustainability focuses on **creating possibilities** rather than solving problems.

Sustainable buildings:

- are connected to and work with their local ecosystem
- do not create problems for someone else
- adopt technologies appropriate to local conditions
- express the culture and ecology of the people.

The more responsibility we take now, the less regulation we will need in the future. It is likely that if we don't start taking action to be more sustainable, more environmental policy will become mandatory.

Salvage/Re-use

Your building has reached the end of its workable life. What are your choices now?

The first thing to ask is "does this building need to be dismantled, or can it be adapted or refurbished to suit new requirements?" The answer to this will depend on many things. Financial considerations often take precedence, but you should also consider other issues...

What is lost if the building is removed?

- Natural landscape or wildlife that is integrated with the building?
- Part of the community's heritage and identity?

If demolition is chosen, then a plan should be prepared to get the most out of the building and building materials. There are still plenty of building materials wasted which could be salvaged, to be recycled or re-used within another building.

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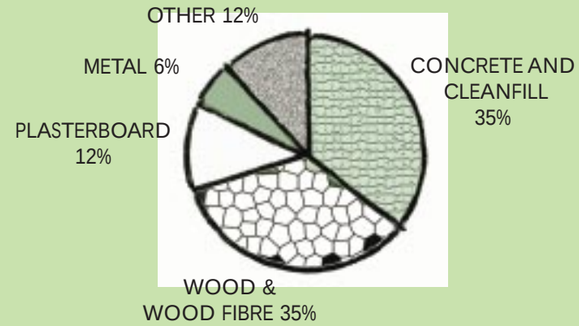


CONSTUCTION WASTE COMPOSITION
AUCKLAND REGION 1997

Life and Use

Sustainable choices made early in the design process result in the most efficient and effective building.These choices will enhance your lifestyle.

Landscape and building working together

18

Use permaculture and organic techniques to work *with*, rather than *against* nature. The aim of permaculture is to create natural life-supporting systems even in the smallest, most urban areas. When we combine the inherent qualities of plants and animals with the natural characteristics of landscapes and structures, a healthier, more integrated environment results.

The key principles are to:

- create positive relationships between all the elements in the environment (buildings, plants, animals, infrastructures)
- place each element to perform many functions (e.g. the right tree in the right place tree provides shelter, shade, food, habitat)
- companion plant to reduce the need for sprays
- grow local native plants which need little care
- use non-hazardous pesticides
- create useful microclimates
- don't treat soil like dirt.

Maintenance to maximise durability and value

Maintaining your building well minimises resource use and pollution in the long term. Keeping a record book of completed tasks and those that need doing will help ensure necessary tasks are carried out on a regular basis, problems are identified early and costs are more easily budgeted for.

This booklet looks at choices at each stage of a building's life.

Site selection

Design

Construction

Life and use

Salvage / re-use

Each reference tag and number in the margin leads you to New Zealand references and contacts provided at the end of this booklet.

Site Selection

Construction is complete. What sustainable choices can you make during occupancy?

Looking at the natural processes and unique features of your site and its surrounding landscape is the first step towards creating a sustainable building.

How clients can assist designers

1 2

You can enhance the sustainability of your building, by choosing aste with:

- **good orientation** - a northern aspect for sun heating
- **existing vegetation** - to provide temperature control, improved air quality and shelter, as well as assisting your landscaping.

How local authorities can assist developers and designers

Councilshave a key role in being able to influence the choices that developers and designers make, for example:

- **developing a planning process** that considers urban design
- **using guidelines** for sustainable development and building
- **encouraging and rewarding** innovative and sustainable practice.

Resources instead of rubbish

8

- Have a recycling station in or near the kitchen, divided into compartments for organics and recyclables (i.e. plastics, glass, paper and metals).
- Compost food scraps and other organic material, to put back into the soil.

The average household generates nearly 20kg of waste per week, more than a third of which is organic. These nutrients are an asset (if composted in a garden) or a burden (if anaerobically land-filled).

Being efficient with energy

- Use energy efficient bulbs; they only use 20% of the energy and last up to 16 times longer than standard bulbs.
- Put a thermal wrap on your cylinder if it is not an 'A' grade.
- Use thermal curtains to keep the heat in.
- When replacing old appliances with energy efficient ones, use the Energy Star Rating label for comparisons.
- Turn off computers after use, and activate their energy saving program.

Nearly half of your energy use is for hot water.

8 10

Life and Use

Possibilities for sustainable building begin with broad land management and planning choices.

14

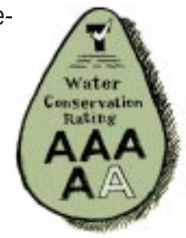
Our buildings connect to both natural ecosystems and urban services. Active buildings use energy and materials to produce by-products such as grey-water, heat and organic material. The natural environment is the source of these processes and eventually absorbs the by-products. We rely heavily on urban services to deliver these resources.

Making more use of freely available natural resources like rainwater, sun and wind reduces the pressure on urban services - saving money and the environment. Becoming more efficient in our use of household resouces reduces the costs of maintenance to both natural and urban systems.

8

Caring for the water cycle

- Flush less away - use a 'gizmo' (weight or brick), *or* adjust the ballcock.
- Choose the most water efficient appliances available- the water efficiency of an appliance can be gauged by its AAAAA rating label.
- Choose front-loading clothes washing machines, which use significantly less water, energy and detergent, as well as lowering wear and tear on clothes.
- Don't tip anything down storm water drains, they drain into your local river and into the sea.
- Generally conserve water - remember that you do pay for every litre of treated water processed by your council.



How developers can assist designers and occupants

Developing a whole subdivision is an opportunity to create high quality sections that aid the design of healthy, efficient and sustainable buildings.

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Developers can consider aspects such as:

- **retaining existing vegetation and topsoil** to reduce erosion and keep nutrients on site
- **minimising stormwater runoff** by limiting hard surfaces
- **shaping sections** to maximise northern aspects
- **providing clear and easy access** to public transport.

Design

The design is finalised. What sustainable choices can be made now?

Many possibilities for sustainability during a building's life are created at the design stage. Designing for as many environmental features as possible will maximise the effectiveness of the building (some designers specialise in green design). However, before you begin designing a new building, consider whether an existing building could be refurbished.

3 4

Influencing the pre-construction stage

1 5

Start early to influence as much as possible:

- specify appropriate eco-design goals within the contract papers (which can be part of the working drawings, specifications or other formal papers)
- design with the natural contours of the site to minimise earthworks and soil wastage
- programme earthworks in the summer to avoid erosion.

Influencing the construction stage

6 7

Contribute to resource recovery and waste management:

- incorporate standard material and product sizes to reduce off-cuts
- design for a logical sequence in construction
- provide accurate project information to avoid variations.

Design for modest, simple form, if possible.

10

Apply the waste hierarchy

- **Reduce:** order only the amount of material you really need; budget for reduced wastage.
- **Re-use:** use it more than once, if safe to do so - e.g. formwork.
- **Recycle:** when you cannot re-use e.g. steel, wood, concrete.
- **Repair:** to extend the product's lifetime.

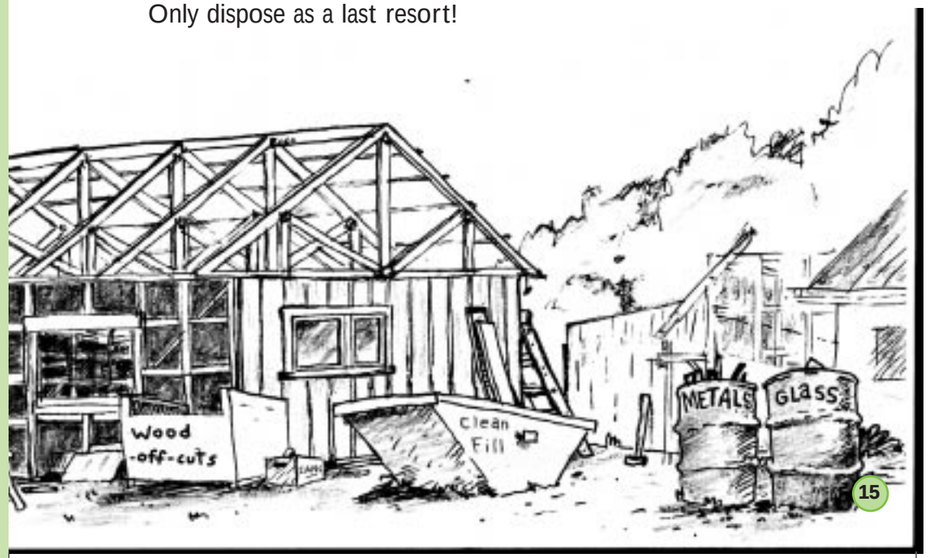
7

Actions to reduce on-site waste

6

- Avoid cutting standard sized material and products where possible.
- Re-use temporary works (i.e. formwork) as much as possible.
- Measure carefully and accurately.
- Separate waste materials by type, into clearly labelled bins.
- Keep your site clean by putting all material into the appropriate bins straight away and clearing bins frequently from the site.

Only dispose as a last resort!



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Construction

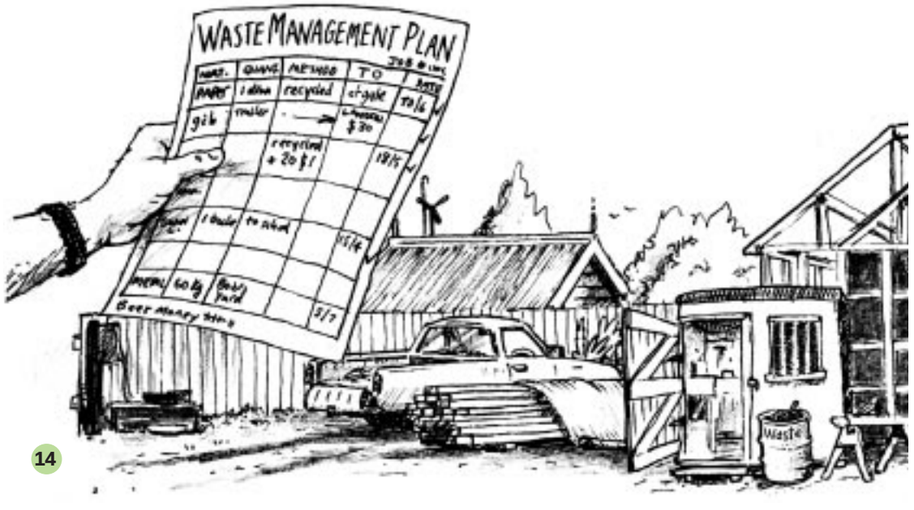
The site is chosen.What sustainable possibilities can be created during the design stage?

Buildings account for around 40% of all materials entering the global economy, of which a large portion ends up in landfills and clean fills. Construction wastes are nothing more than misplaced resources and can be minimised through good site management.

5 7

Management decisions to reduce on-site waste

- Use accurate project information and plans to avoid variations.
- Consult your local council for what can be recycled.
- Make sure all site workers are informed of waste reduction efforts and know what they are expected to do.
- Provide a clearly marked area for 're-use' (off-cuts etc), 'recycling' (metals etc) and 'non-recycling'.
- Check for 'just-in-time' delivery and protection during storage.
- Develop a waste management plan to manage material wastes.
- On larger sites, a facilitator will be needed to educate, monitor and enthuse site workers to ensure success in waste reduction.



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Influencing the potential for material salvage

This is a conscious strategy to increase the chances of building materials being recycled. These are actions which the designer can take to assist disassembly:

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- design for demountability (e.g. bolted rather than fixed joints)
- design with accessibility in mind
- keep accurate 'as-built' drawings.

11

Design

Influencing the life & use of the building

Water conservation, through flow-restricting devices, recycling and alternative water resources.

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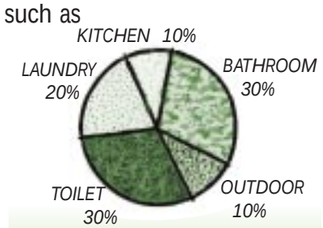
To reduce water:

- specify efficient shower heads which save up to nine litres/minute
- specify dual flush toilets which save up to eight litres per flush
- integrate rainwater collection
- integrate grey-water recycling (e.g. re-using shower water for secondary purposes such as watering the garden)
- consider a composting toilet that may not need any water at all.

All town-supply water is treated to drinking quality, of which only 5% is used for drinking and cooking.



AVERAGE HOUSEHOLD WATER USE

Resource recovery, through the provision of dedicated spaces:

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- incorporate bins into the kitchen/cafeteria and design for separating organic, recyclable and non-recyclable items
- position the compost bin or worm farm so that it is easily accessible from the kitchen
- incorporate loading, storage and pick up areas for larger quantities
- allow for longer term storage of re-usable items (glass jars, paper etc).

Use appropriate materials, by considering their entire life cycles.

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Identifying and selecting eco-materials involves weighing up many attributes. Product attributes that should be considered include whether the product is:

- recycled or recyclable
- sourced locally
- long lasting
- non-toxic
- from a renewable resource.

Purchasing recycled building materials locally is usually a good choice. There are businesses (in most parts of New Zealand) which can provide a wide range of recycled building materials.

Energy efficiency, through passive solar design and efficient appliances.

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To be energy efficient:

- provide a high level of insulation above code requirements
- place living areas orientated towards the north
- use heavy materials to regulate temperature
- design shading to avoid overheating
- specify solar-assisted hot water heating
- design hot water cylinder to be close to amenities
- consider alternative energy generation (wind, solar etc).

Being energy efficient has implications for climate change, scarcity of resources, health, comfort, and living expenses.